Contributing to Cleaner Industry

Clean Systems for the Nation's Basic Industries

- In addition to clean energy options for the electric power industry, the CCT Program is demonstrating technologies to address significant environmental issues and barriers associated with coal use in industrial processes.
- Coke production and use are critical environmental concerns to the steel industry because of associated pollutant emissions. The CCT Program is demonstrating approaches that either displace a portion of the coke or preclude the need for coke.
- Because production costs are largely driven by fuel cost, coal is often the fuel of choice in cement production. The drive to use indigenous coal often leads to burning high-sulfur coals.
- Benefits of the CCT Program in this area include:
  - Enhanced U.S. competitiveness in basic industries;
  - Cleaner industrial operations;
  - Exportable technologies; and
  - Lower consumer product costs through lower material costs.

At Bethlehem Steel's Burns Harbor facility, BFGCI is injecting coal and displacing coke, the primary blast furnace fuel and reducing agent, just about pound for pound. Elimination of the need for coke production also means there is a significant reduction in NO_x, SO_2, and air toxics emissions associated with the coke-making process. This new technology gives the steel industry a clearly superior economical and environmental alternative to the traditional coke oven.

Displacing Coke

At its Burns Harbor, Indiana site on Lake Michigan, the Bethlehem Steel Corporation has installed British Steel's Blast Furnace Granular Coal Injection (BFGCI) technology on two high-capacity blast furnaces.

BFGCI injects granular coal into the blast furnace in place of natural gas (or oil) as a fuel supplement. The injected coal also displaces coke, the primary blast furnace fuel and reducing agent, just about pound for pound. Elimination of the need for coke production also means there is a significant reduction in NO_x, SO_2, and air toxics emissions associated with the coke-making process. Because coal can displace up to 40 percent of the coke requirement, this coal injection technology has significant potential to reduce pollutant emissions and enhance blast furnace production.

Emissions generated by the blast furnace itself remain virtually unchanged by the injected coal. The gas exiting the blast furnace is clean, containing no measurable SO_2 or NO_x. Sulfur from the coal is captured by the limestone flux and bound up in the slag, which is a salable by-product. In addition, by maintaining high raceway temperatures, blast furnace production increases.

At Burns Harbor, the BFGCI is operating in a commercial mode on each of two units that process 7,000 net tons per day of hot metal. Coal injection design rates have been met or exceeded. A BFGCI system has recently been sold and installed at a similar facility owned by United States Steel Corporation.

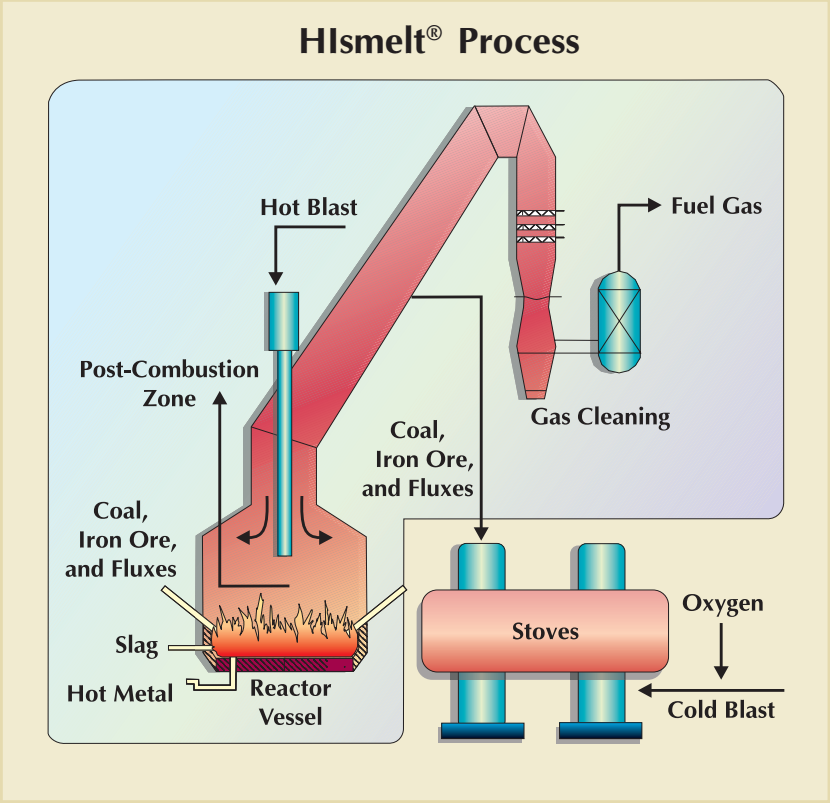
Eliminating Coke Use

The CPICOR™ Management Company is sponsoring a project to demonstrate the integration of a novel direct iron-making process with the production of electricity at Geneva Steel's mill in Vineyard, Utah.

From a number of options, CPICOR™ chose the HIsmelt® process because of its compatibility with western coals and raw materials. The direct iron-making process avoids altogether the need for coke production and thus eliminates emissions normally associated with coke ovens.

Approximately 3,300 tons/day of liquid iron will be produced along with 170 MWe of electric generating capacity. The integrated system includes a smelter with coal injection, which generates gas for use in drying and reducing iron ore. Sufficient heat is produced to melt the resulting iron. Excess reducing gas and recovered process heat go toward generating electric power in a combined-cycle power plant.

Construction is scheduled to start in late 2000 and continue to the spring of 2003. Operational testing will be conducted for approximately two years.



At Dragon Product's cement plant, the Passamaquoddy Technology Recovery Scrubber™ successfully demonstrated use of cement kiln dust, otherwise discarded as waste, to control SO_2 emissions, convert sulfur and chloride acid gases to fertilizer, return the solid by-product as cement kiln feedstock, and produce distilled water. No wastes are generated and the cement kiln dust is recycled.

Cement-Making Industry

At Dragon Products Company's 450,000 tons/year cement plant in Thomaston, Maine, the Passamaquoddy Tribe demonstrated an innovative clean coal technology that solved two environmental problems—air pollution and waste disposal—and, in doing so, the system paid for itself.

The successfully demonstrated Passamaquoddy Technology Recovery Scrubber™ uses cement kiln dust, otherwise discarded as waste, to control SO_2 emissions, convert sulfur and chloride acid gases to fertilizer, return the solid by-product as cement kiln feedstock, and produce distilled water. No wastes are generated and the cement kiln dust is recycled.

The innovative scrubber captured more than 90 percent of the plant's SO_2 emissions. The process also reduced particulate emissions to less than one-tenth the current limit for cement plants, reduced NO_x emissions by up to 25 percent, and produced no wastes, only salable or reusable by-products.

Savings on tipping fees for waste disposal, reuse of the waste products, and sale of the by-products not only offset costs but enable the cleanup system to operate at a profit.